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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
KIM, HEE-YONG

ART UNIT	PAPER NUMBER
2482	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,240	BRULS, WILHELMUS HENDRIKUS ALFONSUS	
	Examiner	Art Unit	
	HEE-YONG KIM	2482	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 June 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claim 3** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites the limitation "the input signal in claim 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claim 1, 4-7, and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Doron (US 6,778,599).

Regarding **claim 1**, Doron discloses Digital Transceiver with Multi-Rate Processing. Doron specifically discloses a multi rate filter (Fig.1) changing sampling rate at arbitrary rational fraction L/M which upsamples input signal by L using interpolator (interpolator 12, Fig.1) and then does digital filtering (digital filter 14, Fig.1) before

decimating by M (decimation 16, Fig.1), in order to do sampling rate conversion (col.1, line 12-24).

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by applying sampling rate change (rational fraction L/M) to frame rate change of video signal by temporally upsampling by L (*creating a plurality of temporal interpolated frames (L-1 frames) between original frames of the video signal*) using interpolator (*using temporal interpolation*) and temporally filtering them (*temporally filtering said plurality of temporal interpolated frames and original frames*) before downsampling by M, in order to do frame rate change of video. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, has all the features of claim 1.

Regarding **claim 4**, Doron teaches everything claimed as applied above (see claim 1). However, Doron fails to disclose wherein the temporal interpolation uses motion estimation and motion compensation.

In the analogous field of endeavor, Sharam discloses Method and Apparatus for Increasing Video Frame Rate. Sharam specifically discloses that the temporal interpolation uses motion estimation (Forward Motion Estimation 110, and Backward Motion Estimation 112, Fig.6) and motion compensation (motion-based interpolation,

col.1, line 66 - col.2, line 17), in order to avoid motion-related artifact by linear interpolate of frames (col.2, line 63).

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by specifically providing temporal interpolation using motion estimation and motion compensation, in order to avoid motion-related artifact by linear interpolate of frames. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating the Sharam temporal interpolation using motion estimation and motion compensation, has all the features of claim 4.

Regarding **claim 5**, The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating the Sharam temporal interpolation using motion estimation and motion compensation, as applied to claim 4, discloses wherein the temporal interpolation creates calculated motion vectors (Sharam: Forward Motion Estimation 110, and Backward Motion Estimation 112, Fig.6).

Regarding **claim 6**, The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating the Sharam temporal interpolation

using motion estimation and motion compensation, as applied to claim 4, discloses wherein the calculated motion vectors are scaled (Sharam: Fig.3) according to desired time moment of the interpolated frame.

Regarding **claim 7**, The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating the Sharam temporal interpolation using motion estimation and motion compensation, as applied to claim 4, discloses wherein the temporal interpolation uses bi-directional motion estimation and compensation(Sharam: Forward Motion Estimation 110, and Backward Motion Estimation 112, Fig.6).

Regarding **claim 9**, Doron discloses Digital Transceiver with Multi-Rate Processing. Doron specifically discloses a multi rate filter (Fig.1) changing sampling rate at arbitrary rational fraction L/M which upsamples input signal by L using interpolator (interpolator 12, Fig.1) and then does digital filtering (digital filter 14, Fig.1) before decimating by M (decimation 16, Fig.1) and summing the outputs of the filter (one or more summers coupled to tap outputs col.3, line 15-17), in order to do sampling rate conversion (col.1, line 12-24).

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by applying sampling rate change (rational fraction L/M) to frame rate change of video signal by temporally upsampling by L (*creating a plurality of temporal interpolated frames (L-1 frames)*

between original frames of the video signal) using interpolator (*using temporal interpolation unit*) and temporally filtering them (*temporally filtering said plurality of temporal interpolated frames and original frames*) using digital filter (*temporal filter unit*) before downsampling by M and summing the tap output (accumulating the outputs of the filter) using a summer (*accumulator*) to produce an output video signal, in order to do frame rate change of video. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M and summing the tap output using a summer to produce an output video signal, has all the features of claim 9.

5. **Claims 2-3 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over Doron in view of official notice.

Regarding **claim 2**, Doron teaches everything claimed as applied above (see claim 1). However, Doron fails to discloses further comprising the step of:
combining output of each temporal filter Stage Output into one filtered output frame per original frame.

However, it was well known in the art that de-interlacing (interlace to progressive conversion) is well known in the art which does frame rate change from 60 interlaced fields per second to 60 progressive frames per second, in order to reduce interlacing artifacts. If we apply this specific conversion to Doron Multi-rate filter, it is equivalent to

downsampling at only original frame (interlaced field) (*combining output of each temporal filter Stage Output into one filtered output frame per original frame*).

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by applying frame rate change to de-interlacing, in order to reduce interlacing artifacts. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating applying frame rate change to de-interlacing, has all the features of claim 2.

Regarding **claim 3**, Doron teaches everything claimed as applied above (see claim 1). However, Doron fails to discloses wherein the input signal is de-interlaced prior to the temporal interpolation.

However, it was obvious to de-interlace input prior to the temporal interpolation if the input signal is interlaced and the wanted output is progressive, in order to do apply the Doron multi rate filter for interlaced input and progressive output, because applying Doron multi rate filter in temporal domain assumes the progressive frames (spatially uniform) and therefore de-interlacing is applied to interlaced input video before Doron's multi rate filter. Also de-interlacing is well known in the art.

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by specifically providing de-interlacing interlaced input video prior to Doron's multi rate filter, in order to convert

interlaced input to progressive output using de-interlacer. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating de-interlacing interlaced input video prior to Doron's multi rate filter, has all the features of claim 3.

Regarding **claim 10**, Doron teaches everything claimed as applied above (see claim 9). However, Doron fails to discloses further comprising: de-interlacing means (104) for de-interlacing the video signal.

However, it was obvious to de-interlace input prior to the temporal interpolation if the input signal is interlaced and the wanted output is progressive, in order to do apply the Doron multi rate filter for interlaced input and progressive output, because applying Doron multi rate filter in temporal domain assumes the progressive frames (spatially uniform) and therefore de-interlacing is applied to interlaced input video before Doron's multi rate filter. Also de-interlacing is well known in the art.

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by specifically providing de-interlacing interlaced input video prior to Doron's multi rate filter, in order to convert interlaced input to progressive output using de-interlacer. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating de-

interlacing interlaced input video prior to Doron's multi rate filter, has all the features of claim 10.

6. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over Doron in view of Bruls (US 2005/0,226,330).

Regarding **claim 8**, Doron teaches everything claimed as applied above (see claim 8). However, Doron fails to discloses wherein the temporal interpolation uses natural motion.

In the analogous field of endeavor, Bruls discloses Method and Apparatus for Motion Compensated Temporal Interpolation of Video Sequence. Bruls specifically discloses wherein the temporal interpolation uses natural motion (natural motion estimator, paragraph 18), in order to obtain good results for frame-rate conversion (paragraph 18).

Therefore, given this teaching, it would have been obvious to one of ordinary skill in the art at the time invention was made to modify Doron by specifically providing temporal interpolation using natural motion estimation and motion compensation, in order to obtain good results for frame-rate conversion. The Doron multi rate filter, incorporating applying sampling rate change to frame rate change (L/M) of video signal by temporally upsampling by L using temporal interpolator (*using temporal interpolation*) and temporally filtering them before downsampling by M, further incorporating the Bruls temporal interpolation using natural motion estimation and motion compensation, has

all the features of claim 8.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HEE-YONG KIM whose telephone number is (571)270-3669. The examiner can normally be reached on Monday-Thursday, 8:00am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha Banks-Harold can be reached on 571-272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/HEE-YONG KIM/
Examiner, Art Unit 2482

/Andy S. Rao/

Primary Examiner, Art Unit 2482
December 29, 2010